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# Use of the Extended Parallel Processing Model to Evaluate Culturally Relevant Kernicterus Messages

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## ABSTRACT

**Introduction:** Kernicterus is a serious but easily preventable disease in newborns that is not well-known even by some health care professionals. This study evaluated a parent guide and poster on kernicterus awareness and prevention generated by the Centers for Disease Control and Prevention. The Extended Parallel Processing Model was used as a framework for creating the interview protocol and analyzing the results.

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**Method:** In-depth interviews were conducted with four parents and six health care personnel of different ethnicities to evaluate the materials. Content for the parent guide and poster was held constant, but photos were varied according to the ethnicity of the baby (white, African American, or Hispanic) and the language in which the interviews were conducted (English and Spanish).

**Results:** The parent guide was evaluated positively, but reactions to the poster were varied. The consensus was that the poster drew more attention than the pocket guide but lacked sufficient information about what jaundice is or how to treat it, while the pocket guide provided information, especially with regard to efficacy. The Extended Parallel Processing Model claims that when efficacy is equal to or higher than perceived threat, respondents should engage in recommended responses, which was the general finding from these interviews.

**Discussion:** Recommendations for improvements of the materials are presented. The focus on different ethnicities in the materials was perceived as unnecessary and potentially counter-productive. Both parents and health care professionals mentioned the lack of information regarding treatment. Providing information on the length and effectiveness of treatment for jaundice and kernicterus might increase efficacy in averting the threat in both conditions. *J Pediatr Health Care.* (2013) 27, 33-40.

## KEY WORDS

Kernicterus, Extended Parallel Processing Model, formative message research

Kernicterus is a serious but easily preventable disease in newborns that is not well known, even by some health care professionals. Jaundice can lead to kernicterus, severe cases of which can cause hearing and vision impairment, cerebral palsy, and brain damage in

newborns (Lazarus & Avchen, 2009). This research reports on formative evaluation of materials designed to increase knowledge and awareness of kernicterus and steps to take to prevent it. The Extended Parallel Processing Model (EPPM; Witte, 1992) was used to assess the reactions of parents and health professionals to these materials via interviews. The materials were designed to appeal to, and interviewees represented, different cultural groups. Interviewee perceptions of the threat presented in the materials and the efficacy that they or their clients were likely to feel were assessed. Results are discussed in terms of the role of the parent or health professional, cultural differences across roles, and suggestions for improvement of the kernicterus awareness materials.

## KERNICTERUS

Infant jaundice is common; it occurs in approximately 60% of otherwise healthy full-term infants, of whom 10% require treatment (Bhutani & Johnson, 2009a; Bhutani, Johnson, & Keren, 2004). Jaundice, which can be recognized by yellowing of the skin and eyes, is caused by a buildup of bilirubin, a byproduct of the deterioration of red blood cells (Lazarus & Avchen, 2009). Although jaundice is common, when severe cases of hyperbilirubinemia are left untreated, a rare and permanent form of brain damage called kernicterus can result.

Although jaundice is common, when severe cases of hyperbilirubinemia are left untreated, a rare and permanent form of brain damage called kernicterus can result.

Kernicterus can cause neonatal death or multisystem disabilities including irreversible athetoid cerebral palsy and hearing and vision impairments (Lazarus & Avchen, 2009).

Of the leading causes of infant neurologic morbidities, kernicterus remains the most easily prevented disorder (Bhutani & Johnson, 2009b; Brites et al., 2009). However, even though it is easily preventable by creating a bilirubin risk index and plotting and monitoring bilirubin levels, kernicterus continues to occur (Eggert, Wiedmeier, Wilson, & Christensen, 2006).

Failures to identify cases of kernicterus have been attributed to a systems breakdown in neonatal care (Johnson, Brown, & Bhutani, 2002). Cost constraints have resulted in the shortening of hospital stays for newborn infants. Early discharge often takes place before many of the signs of jaundice are present, inherently limiting the management of neonatal jaundice (Johnson, Brown, & Bhutani, 2002; Lannon & Stark, 2004; Lazarus & Avchen, 2009; Stark & Lannon, 2009).

Additional systemic limitations exist because of insufficient knowledge regarding the potential for hyperbilirubinemia among professional caregivers (e.g., physicians, nurses, and lactation consultants) as well as the public (Lannon & Stark, 2004; Lazarus & Avchen, 2009). Because of these limitations, parents and caregivers have a greater responsibility to be aware of signs and symptoms of jaundice before it develops into kernicterus (Stark & Lannon, 2009). Thus materials to effectively educate families about jaundice and kernicterus and empower them to take action are essential, yet they have been lacking (Bhutani & Johnson, 2009c; Lazarus & Avchen, 2009).

Addressing the deficits of the care system with educational materials requires a multi-faceted approach to preventative health care that involves parents, nurses, and physicians. Evaluating the material aimed at increasing knowledge and awareness of kernicterus is a practical and preventative approach intended to fill gaps in the health care system that result in undetected cases of a preventable disorder (Lannon & Stark, 2004; Lazarus & Avchen, 2009). Additionally, examining the alteration of materials for the purpose of targeting different ethnic groups might have important implications for how representative members of different ethnic groups make sense of campaign materials.

## THE CENTERS FOR DISEASE CONTROL AND PREVENTION KERNICTERUS MATERIALS

The Centers for Disease Control and Prevention (CDC) created variations of a poster and parent pocket guide intended to increase awareness and knowledge of kernicterus and encourage conversation between parents and medical professionals regarding the condition. Each poster and pocket guide was available with the text in either English or Spanish, and the ethnicity of the babies depicted in the materials varied.

### Poster

The poster was designed to be posted in any location where expectant parents or parents of newborns might be located. The poster suggests that new parents ask a medical professional about having their newborn screened for jaundice, emphasizes the importance of proper treatment, and makes a link between jaundice and kernicterus. Three versions of the poster were created; two posters varied the race of the baby pictured (African American and white) with the text in English, and one poster showed a Hispanic baby with the text in Spanish. (The materials may be viewed at <http://www.cdc.gov/ncbddd/dd/kernicterus/materials.htm>.)

### Parent Pocket Guide

The pocket guide was created as an interactive educational tool for expectant parents and parents of

newborns. The guide includes (a) in-depth information on jaundice and how it is treated; (b) information on how to use the guide; (c) checklists for expectant parents to use before the baby is born (and what action to take if the child is at risk), for parents to complete before they take their newborn home from the hospital (and what to do if the baby is at risk), and for new parents to complete during the first few days the baby is home (e.g., tracking the number of wet and dirty diapers); (d) what to do if the newborn is showing signs of jaundice; and (e) a list of additional Web sites for parents.\*

## EXTENDED PARALLEL PROCESS MODEL

Just as theory is an important guide to message design (Murray-Johnson & Witte, 2003), theory can guide research used to evaluate health messages. Thus each of the CDC's kernicterus materials was evaluated with use of the EPPM as a guiding framework.

The EPPM is an effective and commonly utilized framework in communication health campaigns and is designed to increase the adoption of positive health behaviors (Gore & Bracken, 2005; McMahan, Witte, & Meyer, 1998; Rimal, 2001; Roberto, Meyer, Johnson, & Atkins, 2000; Witte & Allen, 2000). The EPPM attempts to explain how individuals process and respond to threatening persuasive messages by addressing both emotional and cognitive aspects of message processing that contribute to the acceptance of a message (Witte, 1992). An interaction between three factors contributes to the acceptance of a persuasive message: fear, threat, and efficacy (Witte, 1992).

### Fear

Throughout empirical literature, fear has been constitutively defined as a negatively valenced emotion accompanied by high levels of arousal (Lang, 1984; Ortony & Turner, 1990; Witte, 1992). In the EPPM, fear is the drive state leading to the acceptance or rejection of a message (Witte & Allen, 2000). However, the relationship between fear and the acceptance of the message is mediated by the perception of threat (Witte, 1992).

### Threat

Threat is an external stimulus variable that exists regardless of a person's conscious perception of its presence (Witte, 1992). Once a threat is perceived, attention is turned to the perceived severity and susceptibility to the threat. As perceived severity and susceptibility to a threat increase, fear increases as well (Witte, 1992; Witte & Allen, 2000). If perception of threat remains low, fear is not elicited and no further elaboration takes place. The model posits that individuals

receiving a persuasive message with sufficient levels of perceived threat will seek to reduce fear by adopting the recommended action (Witte, 1992). The adoption of a recommended behavior, however, depends upon perceived efficacy.

### Efficacy

Perceived efficacy is an important determinant of the success of a persuasive message (McMahan et al., 1998; Roberto et al., 2000; Witte, 1992) and includes both response efficacy (whether the recommended action is perceived to lead to a reduction in threat) and self-efficacy (the degree to which a person feels he or she is capable of performing the recommended action). As perceived threat and efficacy increase, individuals are motivated to address the presented danger (Gore & Bracken, 2005). This danger control is addressed through adaptive outcomes, that is, changes in behavior that reduce the threat (Witte, 1992). If threat is high and efficacy is low, danger is not addressed and fear control processes are initiated (Gore & Bracken, 2005; Witte, 1992). In these cases, individuals respond to their fear as opposed to the threat and engage in defensive motivation, which may include denial and rejection of the message.

Because the EPPM is a message construction framework well-adapted to the construction of successful health behavior messages (Gore & Bracken, 2005; Hullett & Witte, 2001; Murray-Johnson et al., 2004; Rimal, 2001; Roberto et al., 2000; Smith et al., 2008; Witte, 1997), the model was utilized in this study as a guiding framework for design and analysis of interview questions for multicultural parents and health care professionals as they evaluated kernicterus prevention materials.

## METHOD

### Participants

In-depth interviews were conducted with four parents and six health care personnel. The sample included an expectant couple (the mother and father were jointly interviewed), two mothers with newborn babies, a nurse working in a hospital maternity unit, a pediatrician, a family practice doctor, a public health nurse, an obstetrics physician, and a health education nurse. All participants provided oral consent to participate in the study.

The evaluation ensured equal representation from the three main racial/ethnic groups in the United States: white, Hispanic, and African American. In the sample of 10 people, three persons were white (the mother of a newborn, the family practice doctor, and the health education nurse), three were African American (the mother of a newborn, the maternity nurse, and the obstetrics physician), and four were Hispanic (the expectant couple, the public health nurse, and the pediatrician). The interviews were conducted to evaluate the previously described kernicterus materials.

\*The brochures follow the same ethnicity and language format as the posters in the current study and can be viewed at <http://www.cdc.gov/ncbddd/dd/kernicterus/materials.htm>.

Approval for the research was obtained through the Institutional Review Board, California State University, Sacramento.

## Procedures

The interview protocol featured four key constructs from the EPPM: (a) perceived severity of the threat of kernicterus (“Based on the information in the parent pocket guide [poster], what would you say is the threat and how severe is it?”); (b) perceived susceptibility to the threat of kernicterus (“What is the degree to which this parent pocket guide [poster] makes you feel your expectant baby will be susceptible [new baby is susceptible] to kernicterus?”); (c) perceived response efficacy of the recommended response (“Based on the parent pocket guide [poster], what would you say is the recommended response [what is the degree to which this material makes you feel the recommended response is effective] in averting the threat of kernicterus?”); and (d) perceived self-efficacy to enact the recommended response (“Does the material indicate how to overcome any barriers to performing the recommended response, and does this material make you feel able to perform the recommended response?”). Expectant and new mothers and fathers answered questions on the basis of their personal perspectives, while the medical professionals were instructed to answer from the perspective of their patients as well as in their professional capacities. Participants also were asked about disturbing content, because it could provoke a fear control process that would prevent recipients from processing the message at all. Respondents were asked whether they believed that the materials could be improved, and if so, in what way. They then were asked for their final thoughts. All interviews asked about the parent pocket guide first and the poster second.

## RESULTS

### Reactions of Parents to the Materials

#### Perceived threat and severity

After viewing the materials, all respondents were asked to report the specific threat that was presented. For the parent pocket guide, two parents reported the threat as jaundice causing brain damage, and two cited brain damage. For the poster, two parents reported the threat as jaundice causing brain damage, two cited brain damage, one parent reported the threat as “severe illness,” and another reported the threat as “severe damage possible if not tested.”

#### Perceived susceptibility

All four parents replied “yes” when asked if the parent pocket guide and poster made them feel that their babies are susceptible to kernicterus because of the fact that their baby exhibited one or more of risk factors, such as premature birth.

## Response efficacy

Because of their exposure to the pocket guide, parents’ perceptions of the recommended response ranged from talking to their doctor to watching for signs to getting the infant tested and treated if necessary. After viewing the poster, two parents reported that the recommended response was to contact your doctor, one thought the recommended response was to have the infant tested within 48 hours, and one thought that parents should get their infant tested at the infant’s first checkup if symptoms occurred.

All the parents responded “yes” when asked if both the parent pocket guide and the poster made them feel that the recommended response was effective in averting the threat of kernicterus. With regard to the parent pocket guide, all the parents found the recommended response easy to follow and effective in averting the threat; comments included, “It helps make me feel kernicterus can be prevented,” “Test will tell you if you need treatment,” “See your doctor and they test your baby, they can treat him with blue lights,” and “Simple test and treatment.”

Less consensus was found regarding the response efficacy of the poster. One parent reported, “The only way to know for sure is to test and once you know you can treat it.” Others said, “I’d want more information than the poster gives,” “We need to specifically ask to be tested,” and “Prevention is key.”

## Self-efficacy

Each of the parents reported that it would be easy to follow the recommended response after viewing either the parent pocket guide or the poster. In response to the parent pocket guide, one parent stated, “All you have to do is talk to your doctor during regular appointments, and the checklists are very effective” (at helping her gauge her newborn’s symptoms). The information on the poster made the parents feel confident in their ability to follow the recommended response, as reflected in the following comments: “Easy, just ask your doctor,” “Easy to check with doctor,” “Pretty easy to get baby checked out,” and “Seems easy enough.”

## Disturbing content

None of the parents reported finding anything particularly disturbing about the parent pocket guide content. One parent found the photo of the child on the poster “sad,” but added “it draws your attention quicker, but you need more information” (than is on the poster). Another parent responded “the picture of the boy who is handicap (sic), if I had seen this while I was pregnant I would have freaked out” (because her baby was born with jaundice). Another parent felt the poster did not tell her what jaundice was or how to spot it, so in this case the lack of certain content was disturbing.



### Comparison of parent pocket guide and poster

Table provides an abbreviated overview of reactions to materials by all participants. Whereas the parents were quite positive about the parent pocket guide, they reported that the information on the poster alerted them to the danger and “draws your attention quicker but you need more information.” Another stated the poster “alerts me to go home and look it up” (on the Internet). The parents believed the photo on the poster was necessary but “scary” because it reflects the seriousness of the disease. Only one parent reported the fear control reaction of “freaking out”; three parents reported danger control reactions as a result of seeing both the parent pocket guide and the poster. They said that the poster would encourage them to ask the doctor for more information and go home and look up the disease. One parent said that the poster drew attention and the parent pocket guide provided more information.

### Reactions of Health Care Professionals to Materials From the Perspective of Their Patients

Interviews with health care professionals were intended to elicit feedback regarding their perceptions of their patients’ perspectives of the kernicterus campaign materials.

#### Perceived threat and severity

For the parent pocket guide, three of the health care professionals interviewed reported the threat as jaundice and the other three reported the threat as brain damage. For the poster, five health care professionals thought that their patients would perceive the threat to be brain damage and one thought having a handicapped child would be the perceived threat.

#### Perceived susceptibility

In response to the parent pocket guide, three of the health professionals interviewed believed that their

clients would perceive their babies to be susceptible to kernicterus (“especially if breastfeeding and doing the check list”); two believed their clients would not feel susceptible (“material is well-balanced,” “checklist will alert them one way or another”), and one health professional interviewed believed her clients would perceive their infants to be highly susceptible (based on their reading comprehension, but the checklist would be helpful to decrease their anxiety). In response to the poster, all six health care professionals believed that their patients would perceive high susceptibility to kernicterus. Three believed that the photo would induce this perception, and two believed that the phrase “all babies can get jaundice” would enhance perceptions of susceptibility.

#### Response efficacy

For the parent pocket guide, all the health professionals interviewed believed their clients would perceive the recommended response to be to consult with their medical team (doctors or nurses). Five of the six health care professionals interviewed believed their clients would perceive the recommended response as effective at averting the threat of kernicterus. One of those interviewed believed that the materials did not offer any information on how “effective nor how long they need the treatment” and recommended adding the “percentage of babies that respond to treatment.”

For the poster, four health care professionals believed that their patients would perceive the recommended response to be to see a doctor immediately, and two believed that the recommended response would be to get the baby tested. Four health care professionals believed that the patients would feel that the recommended response is effective in averting the threat of kernicterus if they get the baby checked within the first 48 hours. Two believed that the poster did not address effectiveness per se and that it did not say how easy and effective the test and treatment can be.

**TABLE. Summary of results**

EPPM key constructs	Parent pocket guide		Poster	
	Parents (No.)	Health care professionals (No.)	Parents (No.)	Health care professionals (No.)
Perceived threat and severity	Jaundice (2); brain damage (2)	Jaundice (3); brain damage (3)	Jaundice (2); brain damage (2)	Brain damage (5); having a handicapped child (1)
Perceived susceptibility	High	High (4); not susceptible (2)	High	High
Response efficacy	High	High	High, yet content lacked sufficient information about what jaundice is or how to treat it	High (4); lacked sufficient information on ease and effectiveness of treatment (2)
Self-efficacy	High	High (4); barriers exist (2)	High	High (4); barriers exist (2)
Disturbing content	No disturbing content	No disturbing content	Photo of child is sad (1); photo would be disturbing while pregnant (1); lack of content (1)	Photo of handicapped child

## Self-efficacy

In response to the parent pocket guide, four of the health care professionals interviewed believed that their clients would feel empowered to act by the materials (one added, “if they have access to a doctor, a computer, and/or a phone to pursue questions”). One believed her clients might not be able to act (“the ability to act could be hampered by the fact that they don’t have regular access and dialogue with a physician”). Three believed that their patients would find it easy to enact the desired behavior; one believed that recommended responses, such as using a bili-blanket at home, need to be reiterated; and one believed that their patients might find it difficult because they do not have a standing relationship with a doctor.

After viewing the poster, four health care professionals believed that their patients would feel it would be easy to perform the recommended response, while one believed that the photo and the words “brain damage” would make them feel that the recommended response would be difficult. Others described barriers here such as “response depends on their access to doctor or more information” and “most of our moms don’t have access to transportation, phones, or computers” that would impede feeling able to enact the recommended responses.

## Disturbing content

Four out of the six health care professionals interviewed found nothing disturbing about the content of the parent pocket guide. One found the ethnicity of the infants on the cover disturbing (“If only one ethnicity is available then a baby is a baby, but when you only use three different babies it excludes too many babies”), and the other found the lack of continuity within the parent pocket guide disturbing (“if you put an African American baby on the cover, why not put an African American family inside?”). With regard to the poster, five health care professionals believed that the photo of the brain-damaged child would be disturbing to their patients. One went as far as to say, “The photo of that child is exploitative. I would not hang the poster in an office.” Another health care professional believed that the focus on ethnicity was drawing attention away from the health issue. A collage of children and families with different ethnicities was suggested for the poster.

## Comparison of parent pocket guide and poster

Table provides a condensed overview of these results. Health care professionals had similar answers to self-efficacy questions about the parent pocket guide and poster. However, for all other questions, the poster elicited more extreme reactions than did the parent pocket guide. For example, for the parent pocket guide, the perceived threat was seen as equally divided between jaundice and kernicterus. However, for the poster, five of the

six health care professionals reported that the perceived threat was brain damage. All of the health care professionals reported that their patients would feel that their baby was susceptible after viewing the poster, whereas only four felt so after viewing the parent pocket guide. All of the health care professionals believed that the recommended response was to consult a health team in both cases, but the urgency of doing so was noted after viewing the poster with one respondent saying “Consult your health team NOW.” Whereas none of the interviewees believed that the parent pocket guide included disturbing content, all six believed that the photo of the brain-damaged child on the poster was quite disturbing. Three interviewees said that they would use the poster only if the parent pocket guide was there to accompany it. One interviewee said that the photo of the brain-damaged child would need to be removed before it would be hung in the reception area. One interviewee would hang the poster in the reception area, and one did not answer.

## DISCUSSION

This study utilized the EPPM as a framework for creating an interview protocol to assess formative message evaluation and for analyzing the results. By focusing on perceived fear, threat, and efficacy, the EPPM provides a constructive framework for understanding how campaign materials might be improved and the degree to which the materials will lead to the desired health behaviors.

Across the board, the parent pocket guide was seen positively, but the reactions to the poster were more varied, specifically with regard to threat and disturbing content. The EPPM states that as long as efficacy is as high or higher than the portrayal of threat, respondents should engage in the recommended responses, which was the general finding from these interviews.

For parents, the materials generally resulted in greater awareness of the threat of jaundice and kernicterus and a belief that both conditions are serious health concerns. While threat was perceived, variance was noted in perceptions of susceptibility. Parents were interested in gaining more information. They noted that the materials were effective in

By focusing on perceived fear, threat, and efficacy, the EPPM provides a constructive framework for understanding how campaign materials might be improved and the degree to which the materials will lead to the desired health behaviors.

promoting self-efficacy to avert the threat of kernicterus. The consensus was that the poster drew more attention but lacked sufficient information about what jaundice is or how to treat it. The poster was perceived more extremely in terms of threat and fear reactions; however, perceived efficacy was high after viewing the poster.

The perspectives of health care professionals varied with regard to how patients would perceive the susceptibility of their baby to contracting kernicterus, although susceptibility was higher when viewing both materials versus the parent pocket guide alone. Health care professionals reported a clear recommended response for parents and a high degree of efficacy regarding the parent pocket guide, yet they indicated that the poster lacked information on how easy and effective the treatment can be. As with the parents, health care providers believed that the poster was more extreme in terms of threat than was the parent pocket guide. Specifically, all health care providers reported that the photo of the handicapped child on the poster was potentially disturbing to their patients.

### Recommendations for Improvement of the Materials

The focus on different ethnicities in the materials was perceived as unnecessary and potentially counterproductive. One health care professional argued that if the materials were targeted to certain ethnicities, they excluded too many others. Another health care provider believed that the focus on ethnicity drew attention away from the health issue. Instead, a collage of children and families with different ethnicities was recommended. Using a collage of babies on the front and a collage or a multi-cultural depiction of a family inside the parent pocket guide also would eliminate the need for multiple versions of the campaign materials.

During the interviews, both parents and health care professionals mentioned the lack of information regarding the treatment of jaundice and kernicterus. Providing information on the length and effectiveness of the treatment for jaundice and kernicterus and the percentage of babies who respond to the treatment might increase efficacy in averting the threat to either condition.

### Recommendations for Health Care Professionals

Failures to identify cases of kernicterus have been attributed to a systems breakdown in neonatal care (Johnson et al., 2002). Given the limitations of the current health care system (i.e., cost constraints, early discharge, and insufficient knowledge surrounding threats), a greater need exists for parents and caregivers to be aware of signs and symptoms of jaundice and to understand that jaundice can develop into kernicterus (Stark & Lannon, 2009). As such, several recommenda-

tions are presented for health care professionals, including physicians, advanced practice nurses, maternity nurses, public health nurses, and health educators.

The first recommendation is that health care professionals use both the parent pocket guide and the poster together or the parent pocket guide alone but not the poster alone, because it might increase fear control processes without providing information on efficacy. Second, health care professionals should attempt to increase efficacy in the parents of newborns with jaundice by showing that the treatment can be done with relative ease and is quite effective at averting the threat of kernicterus. Third, health care professionals should assess patients' reactions to materials before assuming that they will be disturbing to them. In this study, health care professionals believed that parents would have stronger negative reactions to the materials than was the case.

**In this study, health care professionals believed that parents would have stronger negative reactions to the materials than was the case.**

### CONCLUSION

Despite the easily preventable nature of kernicterus, it continues to occur. Formative evaluations of materials such as this study aim to increase knowledge and awareness. This process is one step in overcoming the current system limitations. Addressing the deficits of the health care system with educational materials requires a multi-faceted approach to preventative health care that incorporates patients and health care providers. Through the solicitation of feedback from parents and health care professionals, greater insight has been gained regarding materials evaluated here and the efficacy that they or their clients are likely to feel regarding disease prevention and control. Research such as the current study identifies barriers that might exist between knowledge, awareness, and prevention—in this case, the prevention of kernicterus.

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